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AGRICULTURAL Research

U.S. DEPARTMENT OF AGRICULTURE

NOVEMBER 1968



From Farm to Market Basket

A time of thanksgiving—this November holiday—a time to gather gratefully around tables laden with the land's harvest bounty.

Our Nation is the best fed in history. An American farmer feeds himself and 42 other people. His efforts enable a typical supermarket to offer consumers a choice of 7,000 food items—at any season and at a cost averaging only 18 percent of take-home pay. It takes a highly efficient marketing system to bring food from farms to the large cities where most of our people live.

Unfortunately, many cities lack efficient food distribution centers. Most of their facilities were not planned: they “just grew” in places that served the more leisurely commerce of several decades ago. They often consist of antiquated, two-story buildings that are crowded, unsafe, and unsanitary. Adjacent streets are too narrow to cope with trucks and vans making deliveries or pick-ups. Rail, highway, barge, or airport facilities may be miles away. Bedlam, spoilage, and high costs are inevitable.

ARS marketing researchers are helping change this situation. These researchers conduct studies at the request of cities that urgently need modern food centers. Local organizations agree to cooperate and to act on the ARS-developed proposals.

So far 65 cities have been surveyed and more than half have either begun, completed, or decided to build a new—and custom-tailored—food distribution center. Typically these centers are: situated on low-cost land away from the inner city, designed to unload carriers directly into buildings; provided with one-story buildings with floors at truck and railcar level for easy mechanical cartage; located near transportation arteries; and spacious enough for future expansion.

When all 65 markets are completed they will bring savings of \$100 million a year. The savings of only two weeks will repay all the money that ARS has spent in its 33 years of providing this kind of research and service.

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Editor: R. P. Kaniuka

Managing Editor: E. H. Davis

Contributors to this issue:

R. C. Bjork, B. D. Carriere,

J. P. Dean, M. C. Guilford,

L. W. Lindemer, M. M. Memolo,

D. P. Movitz, M. F. Tennant,

P. A. Underdue, D. M. Webb

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Orville L. Freeman, Secretary

U.S. Department of Agriculture

G. W. Irving, Jr., Administrator

Agricultural Research Service



Research technician D. R. Lee inserts single orchardgrass leaf into airseal of device for measuring photosynthesis. The new concept illustrated here permits making this measurement with the leaf still attached to plant (ST-4009-1).

A new concept for MEASURING PHOTOSYNTHESIS

A NEW AIR SEAL concept enables scientists to make faster, simpler, and more versatile measurements of photosynthesis. These measurements are vital in selecting plants with potential for the highest productivity.

In photosynthesis, plants use sunlight to convert water and carbon dioxide into carbohydrates. The rate of photosynthesis can be determined by measuring the amount of carbon dioxide that a plant takes from the air during the process. Leaves or plants to be tested, however, must be enclosed in airtight containers to control temperature, humidity, and carbon dioxide concentration.

With conventional methods, a leaf is removed from a plant and sealed in a receptacle, or a receptacle is placed over a leaf attached to a plant,



then sealed off from outside air with a clamp or stopper. Neither process is entirely satisfactory. The first method allows but one observation, and the other may damage the specimen.

These problems are eliminated with the air seal concept developed by agronomist G. E. Carlson, plant physiologist R. B. Pearce, research technician D. R. Lee, ARS researchers at Beltsville, Md., and by agronomist D. D. Wolf of the Virginia Agricultural Experiment Station, Blacksburg.

Their device allows repeated tests without damage to specimens. Measurements can be made at a rate of 15 to 20 an hour—6 to 20 times faster than other methods. The device can be used in the field as well as in the laboratory.

The air-seal apparatus attaches to one end of a chamber, eliminating the need for a clamp or stopper. It permits quick leaf insertion while providing an air cushion around the leaf to prevent injury.

Two types of receptacles have been designed with the air seal—one for broad-leaf plants, the other for narrow-leaf. However, the researchers

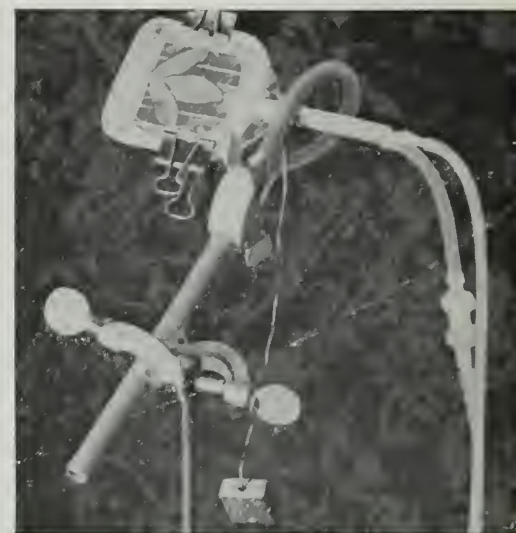
foresee use of the device broadened to measure the photosynthesis of entire plants of almost any size.

Though the present receptacles differ in size and shape, the working concept is the same. A leaf is inserted through the air seal into a chamber, then air with a known amount of carbon dioxide is drawn across the leaf and, at the same time, through another chamber without a leaf. The two air streams are chemically dried, and the difference of carbon dioxide concentration measured.

A mixing well assures that the amount of air entering both chambers is equal. The air is pumped in with enough force to maintain a positive pressure in the mixing well and prevent entry of outside air.

The research team says that the new device is versatile enough for use in physiological studies requiring critical environmental control and for breeding studies requiring the evaluation of large numbers of plants.

The chambers have proved effective at both Beltsville and Blacksburg in studying photosynthetic responses of alfalfa and of several species of grass grown in special environments. ■



Top Left: Plant physiologist R. B. Pearce checks carbon dioxide output of test plant, as recorded on print-out of infrared analyzer; Lee monitors plant in growth chamber (ST-4009-12). Upper Right: New air seal device adapted for measuring photosynthesis of broad-leaved plants (PN-1697). Lower Right: Air seal device in use with narrow-leaved plant in the field (PN-1696). Cover: Close-up view of air seal (ST-4141-1).

THE NATURAL ATTRACTION of mosquitoes to their human victims and to egg-laying sites may doom these pests.

Entomologists at Gainesville, Fla., are studying more than 100 kinds of attractants to determine which materials lure mosquitoes and why some materials work better than others. Effective attractants could be used to lure mosquitoes to traps or to selected areas treated with insecticides. The amount of insecticides needed to kill the pests might thereby be reduced.

At Gainesville, ARS entomologist C. E. Schreck and laboratory aide J. D. James succeeded in attracting female yellow-fever mosquitoes to a broth made from human skin bacteria. Live bacteria on the skin, or in a laboratory broth, may not be the primary lure to the mosquitoes, however. Interactions between bacteria and other microorganisms, dead bacteria, or their decomposition products may draw the mosquitoes.

ARS chemists Fred Acree, Jr., R. B. Turner, and Morton Beroza attracted yellow-fever mosquitoes to *L*-lactic acid, which is found on skin and in sweat. Laboratory tests showed that persons who produced the most lactic acid attracted the most mosquitoes.

Attractiveness of lactic acid to mosquitoes increased when carbon dioxide (CO_2) was present. Although other research also shows that CO_2 is a factor in attracting mosquitoes, ARS scientists now believe that this gas acts to enhance the drawing power of other attractants rather than acting independently.

Differences in skin temperature might be involved in attracting mosquitoes according to earlier research (AGR. RES., February 1965, p. 16), but recent tests on yellow-fever mosquitoes by ARS entomologist M. S. Mayer varied from the earlier results. To eliminate other factors that could attract the insects, Mayer used equipment simulating the temperatures of

human skin. He obtained no difference in response to heat given off by the skin.

Female mosquitoes are also attracted by the odors of favorable egg-laying sites. Mayer, entomologist E. I. Hazard, and technician K. E. Savage stimulated southern house mosquitoes to lay eggs by attracting them to a solution containing bacteria isolated from hay (AGR. RES., March 1967, p. 16). Chemicals produced by the bacteria were the active agents that lured the mosquitoes, the entomologists believe. In Oregon

tests made by ARS entomologist L. F. Lewis, odors of log ponds also attracted mosquitoes.

In another approach to possible use of attractants to control mosquitoes, ARS entomologist C. M. Gjullin and technician T. L. Whitfield found that both the northern and southern house mosquitoes and another species, *Culex tarsalis*—a carrier of sleeping sickness—have male sex attractants. If the attractants can be chemically identified, a synthetic material might be developed to lure females to their death.

Searching for Mosquito Attractants



This cage contains salts and salt concentrations for testing the egg-laying site preferences of various species of mosquitoes. Some may prove capable of luring females to traps or to unfavorable egg-laying sites (PN-1698).

THE CHINESE HAVE BEEN making a soybean cheese called sufu for centuries, but it remained for scientists to develop a foolproof method of producing good sufu with no undesirable off-flavors.

N. S. Wai of the Academy of Science, Taiwan, found that the key to making sufu without a beany flavor is to ferment with a pure culture of the fungus *Actinomucor elegans*. Using the production methods tested and modified by Wai, ARS microbiologist C. W. Hesseltine says acceptable Western flavors can easily be incorporated into the soy cheese during the last manufacturing step, the brining process, by adding essences such as garlic, wine, or pepper.

The research, part of a continuing program to find better ways to use soybeans in meeting the world protein shortage, was conducted by Wai under a Public Law 480 grant from ARS. Hesseltine, stationed at the

Northern utilization research laboratory, Peoria, Ill., was the sponsoring scientist.

Sufu is made from a soybean curd called tofu (AGR. RES., Mar. 1960, p. 5). The tofu is cut into $\frac{3}{4}$ -inch cubes, immersed in an acid-saline solution, and sterilized. The cubes are then inoculated with *A. elegans* and incubated at 68° F. for 2 to 3 days. At this stage, the cubes are covered with white fungous mycelium somewhat like that of Camembert cheese. Larger cubes are impractical because the enzymes of the fungus cannot reach deeply enough to produce the enzymatic action necessary for protein breakdown—the cubes would be firm on the outside but unchanged inside.

During the last step, the cubes are aged in a solution containing table salt or any other agent that prevents spoilage and halts mold growth. Sufu, the final product, is soft, pale yellow,

and has a pleasant taste and aroma.

In related work, Wai developed several methods for preserving sufu besides canning. He found that sufu coated with paraffin would keep for a month; stored at room temperature in carbon dioxide or nitrogen, it would keep for about 40 days. Wai also determined that sufu could be freeze-dried.

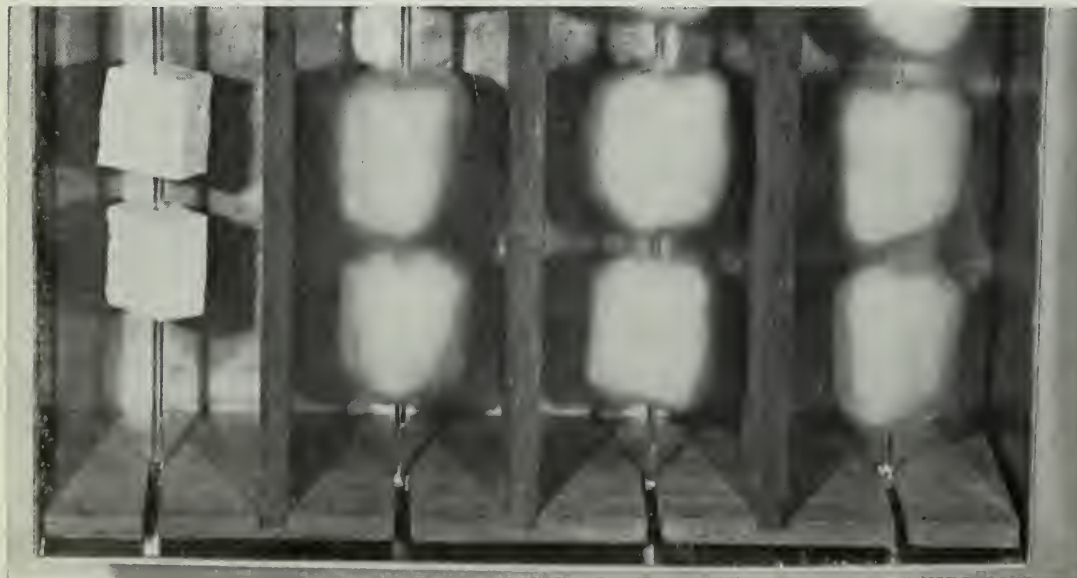
Changes occurring in the soy material during fermentation show that *A. elegans* not only produces the enzymes which convert protein into usable amino acids but also enzymes which break down the lipids in the soy material. This additional enzyme system will require further study.

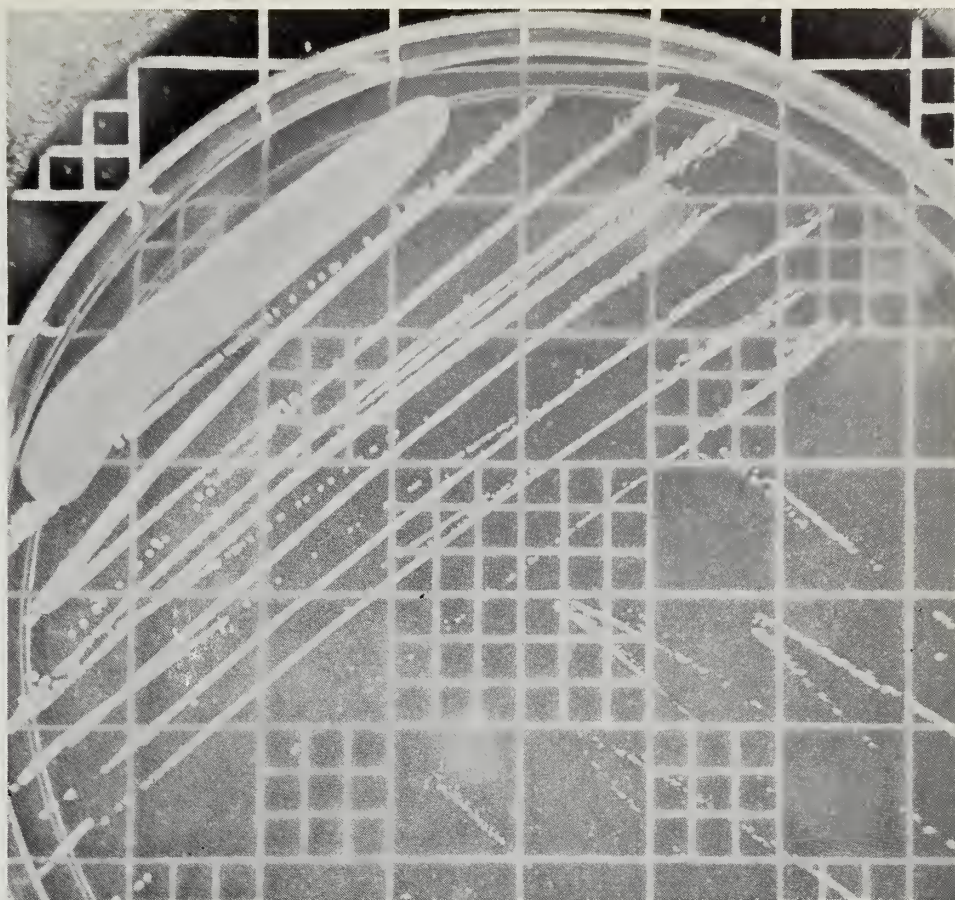
Nutrition questions must also be answered. Although Wai found in the cell walls of *A. elegans* seven amino acids, three of which—valine, leucine, and isoleucine—are essential to human nutrition, humans may not be able to digest these cell walls.■

From P.L. 480 Research . . .

BETTER SUFU

Left: Sufu is made from cubes of a soybean curd called tofu, shown on extreme left. After cubes are inoculated and incubated they become covered with mold (PN-1699). Right: End product, sufu, cuts and slices easily (PN-1700).





Scientists Link

Heat-Tolerant Bacteria to Milk Spoilage Problems

Left: Dropping a dilution of heated suspension containing bacteria into a growth dish (ST-4051-6). Right: Growth of bacteria is measured 48 hours later in a colony counter (ST-4051-8).

LONGER STORAGE LIFE for pasteurized milk?

ARS scientists are checking out a theory that may someday lead to solving the problem of milk spoilage—a problem that plagues homemakers, grocers, and dairymen alike.

Refrigerated pasteurized milk spoils in 10 to 16 days. Dairy scientists trace this spoilage to cold tolerant (psychrophilic) bacteria. Researchers, however, have long been puzzled because they can seldom isolate psychrophilics from freshly pasteurized milk. Yet such bacteria are present in milk after a week or two.

Researchers have advanced various theories to explain the occurrence of psychrophilics in pasteurized milk. One theory is that a few bacteria survive pasteurization but that this num-

ber is too small to be detected. Other theories are that some types of bacteria become psychrophilic or that contamination after pasteurization introduces psychrophilics.

Recent studies by ARS dairy scientists Roger Dabbah and W. A. Moats at Beltsville, Md., in cooperation with J. F. Mattick at the University of Maryland, College Park, show that psychrophilics may be merely injured by the pasteurization process and might recover during storage.

This research represents a new approach to the problem of milk spoilage. Further research will be directed toward gaining a better understanding of heat injury and recovery of bacteria.

The scientists heated a culture of psychrophilics to a point below pas-

teurization temperature where no survivors could be detected when the culture was plated on agar. They then stored the culture for a few days. In 2 to 3 days, bacteria reappeared in the culture and grew normally.

The investigators point out that the strain of bacteria used in these experiments did not recover when heated to pasteurization temperature. They consider it likely, however, that many types of bacteria could recover following pasteurization.

The type of medium in which the bacteria were grown, heated, and stored following heating strongly influenced the degree of heat tolerance of the bacteria. In the experiments, bacteria were generally most heat tolerant in complex media such as milk whey. ■



Strengthening the Staff of

SOYBEAN AND OTHER OILSEED flours can replace part of the wheat flour in ordinary bread to double the amount of protein.

R. H. Matthews, ARS research food technologist, is working out blueprints for bread containing 20 percent or more protein, compared with the usual 9 or 10 percent. Her assignment is part of an ARS effort to set up basic guidelines for nutritionists, food chemists, and processors in the use of high-protein oilseed flours and concentrates.

Breads are basic foods both in the United States and in the developing countries. They have been a dietary staple for more than 8,000 years, ever since the Swiss Lake Dwellers learned how to mix flour and water into a dough which they poured onto heated stones to bake. Hopefully, breads containing oilseed flour can go a long way toward meeting the needs of a protein-hungry world—if they can be made tasty and simple to prepare.

The first flours to be tested are those from cottonseed, peanut, soy, and safflower seed. All are low in carbohydrate and high in protein compared with regular wheat flour.

How much oilseed flour can be successfully incorporated into bread dough? Because these flours alter the dough mixture through changes in starch gelatinization, protein coagulation, and other physical aspects of dough-making, scientists originally thought they could replace not more than 5 to 8 percent of the wheat flour in bread and still have a satisfactory product. But Matthews' preliminary studies indicate that up to 25—perhaps even 40—percent replacement of wheat flour by oilseed flour is possible by changing amounts of the various dough ingredients and by revising methods of dough preparation, depending on the type of oilseed.

The procedure leading to a bread formula is complicated. Three cereal laboratory instruments—farinograph,

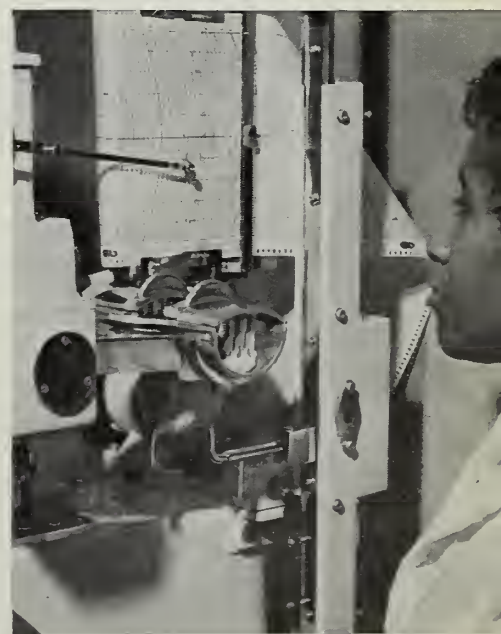
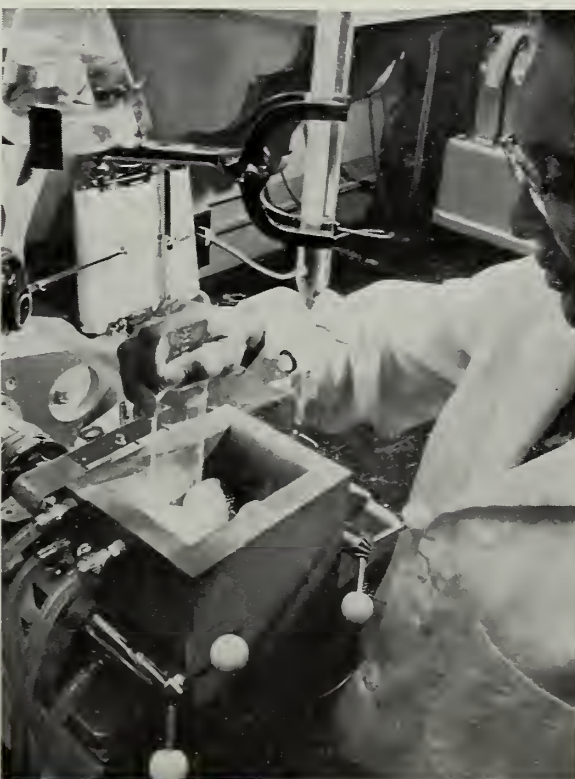
Life

extensigraph, and amylograph—are employed to measure the physical properties of flour mixtures containing varying amounts of oilseed flour. These instruments measure liquid absorption, the length of time the dough mixture remains at standard consistency, resistance to mixing, and the breakdown of dough during mixing. All of these characteristics are affected by the amount and type of protein, fat, and carbohydrate present in the different oilseed flours. Several staining procedures enable the researchers to trace the distribution of oilseed flour throughout the dough.

The preliminary studies indicate that processors of oilseed flours should consider raising the level of fat (except for full-fat soy flour) and increasing the size of flour particles. They also show that oilseed and wheat flours must be uniformly blended, preferably by sifting, and that more liquid is required than in ordinary wheat bread.■



Left: Technician takes dough sample from conditioning cabinet. The cabinet holds each dough sample at same temperature and humidity for extensigraph reading (ST-4150-5). Lower Left: Laboratory technician Elinora Sharpe measures the mixing ability of a blend of flour with a farinograph (ST-4150-11). Below: Laboratory technician W. M. Clark measures stretching and elasticity of dough with an extensigraph (ST-4150-3).





Plant pathologist P. B. Adams examines bean plant infected with fusarium root rot (PN-1701).

COFFEE GROUNDS

versus

FUSARIUM ROOT ROT

SPENT COFFEE GROUNDS have been successfully used in greenhouse experiments to control *Fusarium* root rot, a serious disease of beans.

This disease, caused by the soil-borne fungus *Fusarium solani* f. *phaseoli*, destroys 6 percent of the U.S. snap bean crop every year. It attacks the roots of the plant, causing stunted growth and reduced yields. At present there are no resistant varieties and no adequate chemical controls.

The need for a biological control and the availability of large quantities of spent coffee grounds from the instant coffee manufacturing industry gave an ARS research team the idea of determining whether the grounds might help control the disease.

Plant pathologist P. B. Adams, soil scientist J. A. Lewis, and microbiologist G. C. Papavizas at Beltsville, Md., added coffee grounds at several dif-

ferent rates to soil infected with *Fusarium* pathogens and found that the grounds substantially reduced *Fusarium* root rot of beans.

In a series of tests to determine how soil amended with spent coffee grounds controls the disease, the scientists noted that the coffee grounds increased the number of spores in the soil, yet made the soil much more "fungistatic" than normal. Fungistasis is a so far unexplained phenomenon observed in normal soils in which the germination of fungal spores is prevented.

In normal soils, however, exudates from germinating seeds and plant roots contain substances that allow spores to overcome normal soil fungistasis and thereby germinate, grow, and infest susceptible plants. The increased level of fungistasis in soil amended with coffee grounds, however, prevented the spores from germinating, even in the presence of exudates from germinating bean seeds.

The scientists found that disease control was greatest when beans were planted at least 7 days after adding the spent coffee grounds to the soil.

Although they obtained substantial control of root rot in greenhouse experiments, the scientists do not yet know how variable field conditions and fertilizer applications might affect the disease control provided by the coffee grounds. Moreover, the coffee grounds increased the number of spores in the soil, which could worsen disease conditions the following year, and so the technique is not recommended at this time.

Adams is, however, continuing experiments to learn more about soil fungistasis and how it affects fungi in the soil. ■

Precut Scions

'Stretch' Pecan Grafting Season

PRECUR SCIONS ENABLE pecan propagators to make more grafts during the relatively short grafting season.

Until recently, grafting had been limited by the requirement for freshly cut scions and by the short period for getting this work done—roughly 6 to 7 weeks beginning in early spring.

In a 2-year experiment at the U.S. Pecan Field Station, Brownwood, Tex., ARS horticulturist G. D. Madden found that precut scions required no recutting before insertion onto the stock. The use of precut scions eliminates the time-consuming process of preparing freshly cut ones at the time of insertion. Madden's success with pecans suggests that the technique may also be employed in grafting other deciduous species.

Graft-success for the precut scions varied from 72 to 100 percent in 1965, and from 77 to 86 percent in 1966. The time lapse from cutting of scions until insertion onto the stocks varied from 0 to 216 hours in 1965, and 0 to 96 hours in 1966.

By comparison, graft success for scions inserted immediately after preparation was 100 percent for no time lapse from time of cutting to insertion, and 95 percent for 0-4 hours time lapse during the 1965 tests. In 1966, graft take for freshly cut scions



Left: Precut scions stored in polyethylene, ready for grafting (PN-1703).



Right: Large seedling pecan tree topworked with precut scions at the U.S. Pecan Field Station in Brownwood, Tex. (PN-1702).

was at the 81 percent level.

The slight decrease in graft success percentage for precut scions is somewhat compensated by the advantages precut scions have over freshly cut ones:

- The propagator may cut scions at his leisure or when he could not normally graft.
- A skilled propagator may pre-cut scions for insertion by several

propagators who are less-skilled.

- The scions may be cut and prepared with greater accuracy.
- Precut dormant scions may be sent through the mail for later insertion or stored in sealed polyethylene bags if the propagator must travel great distances before making the insertion. Scions should be stored with enough moisture to prevent drying. ■



Workers install a sprayed asphalt-fiberglass lining in a 165,000-gallon stockwater reservoir (PN-1704).

Rx for seeping reservoirs

MILLIONS OF GALLONS of water and hundreds of thousands of dollars are lost annually in this country through seepage from stock water dams, reservoirs, and irrigation canals.

Although seepage problems are highly variable, and no single corrective method or material can be applied in all situations, four recently developed methods deserve consideration by anyone confronted with such problems: Sodium carbonate applications, sprayable crack sealers, waterborne asphalt emulsions, and asphalt-fiberglass linings. The first two methods have already been described in this magazine (Dec. 1965, p. 13, and Apr. 1966, p. 4).

Waterborne asphalt emulsions, one of the newer methods, can be applied as reservoirs are being filled or after they have been filled. The asphalt moves with the water and mechanically plugs the soil pores.

Several conditions must be met, however, for reasonable assurance of success:

- Emulsion must be stable and infinitely dilutable in water.

- Soils should not swell or expand in water.
- Weed growth should be eliminated.
- Seepage rates should exceed 1 foot per day.
- Damage to seal should be prevented.
- Water should be in the pond continuously.

ARS hydraulic engineer L. E. Myers and soil scientist R. J. Reginato, Phoenix, Ariz., tested 20 different asphalt emulsions in hundreds of laboratory tests and more than 50 field trials to develop this method.

Cost of the treatment ranges from 75 cents to \$1 per square yard, but Myers thinks that competitive production could cut this cost in half.

Ease of application, especially in places where water cannot or should not be drained, makes the emulsions especially attractive for reducing seepage. Although some test ponds are now being used to raise fish, the emulsion is toxic to fish for 2 to 4 months after application.

The other new method, asphalt-fiberglass linings, permits fabrication

in the field to form strong, impermeable reservoirs, say ARS hydraulic engineers G. W. Frasier and Myers.

The sides and bottom of the reservoir are first shaped to be reasonably smooth, with compaction desirable but not vital. Asphalt is then sprayed on the soil and an unwoven fiberglass matting is laid over the sprayed soil in 4- to 8-foot strips; the fiberglass is then sprayed with asphalt emulsion.

Water in the emulsion dissolves the starch sizing in the fiberglass so that the mat conforms to irregularities of the soil surface. After a few days of curing, the mat is sprayed or mopped with a protective coating such as asphalt-clay roofing emulsion.

Lining materials cost about 55 cents per square yard. Installation is relatively easy and rapid. Lining a 4,600-square-foot reservoir requires less than 40 man-hours. Total cost of the lining, including labor, is about 80 cents per square yard.

Two asphalt-fiberglass-lined reservoirs in northern Arizona are in excellent condition after nearly 6 years of service.■

AN EXPERIMENTAL MACHINE promises to dispose of old-crop stalks and roots in cottonfields more efficiently than conventional equipment—and eliminate one tillage operation as well.

Cotton growers now chop cotton stalks with a rotary cutter, then loosen and separate the roots from the soil with a disk harrow. Studies at Stoneville, Miss., indicate that disk harrowing separates only 15 percent of the roots in Tunica silty clay loam soil and 44 percent in Bosket fine sandy loam.

ARS agricultural engineers J. R. Williford, O. B. Wooten, and E. B. Williamson devised a way to cut the stalks and remove the roots in a single operation. And their machine separated 88 percent of the roots in Tunica soil and 97 percent in Bosket.

They modified the framework of a

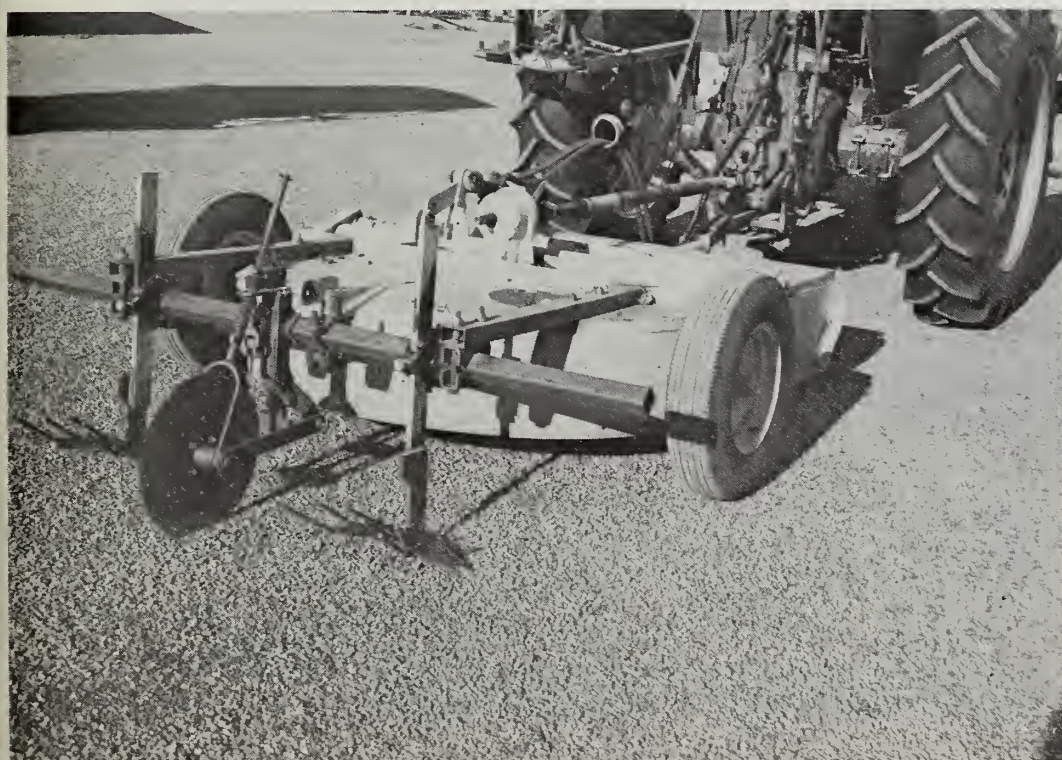
commercial trailing rotary cutter and added a standard toolbar on the rear. Various cutting devices were attached to the toolbar for tests.

Best results were obtained with a pair of 16-inch, high-lift sweeps with trash rods extending to the rear. The sweeps lift the soil 3 inches, and the rods give additional lift to the stubble, separating it from the soil. Without the rods, the roots were sheared below the soil surface but were not removed.

The engineers say no trash buildup occurred in tests with the machine, which performs satisfactorily under both wet and dry field conditions and can be operated at speeds up to 8 miles per hour. Further research is needed, however, on a device to center the sweeps on the rows.

The Mississippi Agricultural Experiment Station cooperated in these studies. ■

new approach to **Disposal** **of Cotton Crop Wastes**



Above: Experimental machine travels through field without any buildup of crop residue around sweeps (PN-1705). Left: The machine employs pair of 16-inch high-lift sweeps with trash rods that shear cotton plant roots below soil (PN-1706).

PORTABLE GAS CHROMATOGRAPH

**speeds on-site analysis
for pesticide residues**



Representative of F. & M. Scientific Division of Hewlett Packard prepares tomato sample for gas chromatography analysis of pesticide residues. Unit weighs about 225 pounds and can be transported in a station wagon (ST-3938-5).

A PORTABLE LABORATORY equipped with a gas chromatograph, an instrument used for identifying insecticide residues, has been developed for analyzing food samples rapidly in the field.

This laboratory is one result of ARS-sponsored research on simple, fast, on-site methods for determining if food samples contain insecticide residues in excess of permissible levels.

Most samples are presently sent from the field to central laboratories for analysis. On-site facilities for preparing samples and measuring and identifying insecticide residues would save considerable time and inconvenience during inspection while increasing surveillance capabilities. Perishable commodities could be cleared and sent on their way many hours sooner by using more rapid screening procedures.

The newly developed laboratory unit is sensitive enough to detect residues which exceed permissible levels in samples of most agricultural commodities (permissible levels are established by the Food and Drug Administration). Doubtful samples could be sent to a central laboratory for more exhaustive analysis.

The use of gas chromatography makes the unit potentially capable of analyzing for as many as 60 different insecticides. Moreover, a single operator with only limited chemical training could analyze and measure the insecticide content of at least four samples an hour.

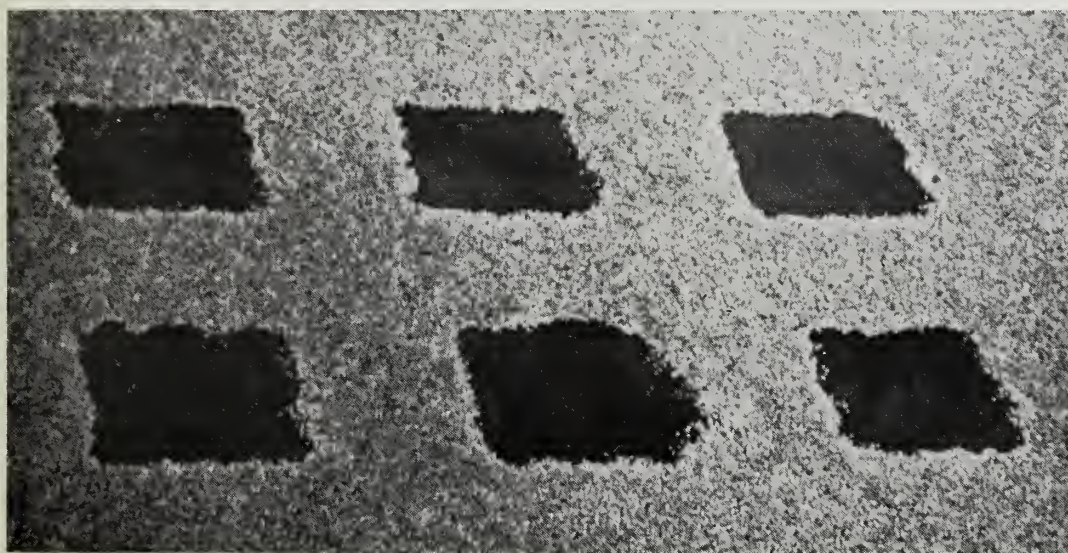
The unit was designed primarily for use by food inspectors and graders at such places as railway sidings, grain elevators, markets, or docks. It could also be set up in a field or plant to help large producers or processors detect insecticide residues in their commodities.

The commodities tested could be field crops, fruits, vegetables, or animal products. Researchers at the F. & M. Scientific Division of Hewlett Packard, which developed the unit under an ARS contract, feel the laboratory could be modified for testing soil, water, or air for contamination.

The laboratory can be transported in a station wagon. With equipment, supplies, and battery power source for at least 8 hours of field operation, the complete unit weighs about 225 pounds.

The Consumer and Marketing Service, USDA's inspection and grading agency, is field-testing the unit. Commercial production of the unit or a modification is anticipated. ■

AGRISEARCH NOTES



The sheen of water breaks through tangle of white water lily, precisely marking plots treated with granular formulations of dichlobenil (PN-1707).

One-shot Control for Waterlilies

A single application of the herbicide dichlobenil gave better than 99 percent control of the white waterlily.

This aquatic weed infests the shallow areas of many lakes and ponds in the Pacific Northwest, interfering with pump irrigation and spoiling the water for fishing, bathing, and skiing. It also provides a breeding place for mosquitoes and reduces the waterfowl habitat.

In research by ARS plant physiologist R. D. Comes and biologist L. A. Morrow at Prosser, Wash., a granular formulation of dichlobenil was applied to six 50-foot-square plots leaving 50-foot untreated borders. The applica-

tion was made in mid-April, when waterlily leaves were beginning to emerge from the surface of the lake.

After the application, the plants immediately ceased to emerge, and by mid-July, 99-percent control was evident on all the treated plots. This degree of control lasted all season. Moreover, the dead plant tissue did not rise to the surface, a problem with herbicides currently used to control white waterlily. Other aquatic weeds did not invade the treated areas.

The clear demarcation between treated and untreated plots indicated the herbicide did not move laterally.

Dichlobenil is registered by USDA for use on lakes and ponds but not on potable water.

Gin Trash Curbs Wind Erosion

Gin trash may help cotton farmers cut wind erosion losses on exposed loamy fine sand.

Utilizing gin trash would also reduce waste disposal problems at the gin where materials such as sticks, burrs, stems, and bits of leaves removed from cotton must be blown to an incinerator, burr hopper or trash pile, increasing the gin operator's costs and polluting the air.

ARS scientists based at Big Spring, Tex., tested applications of 0, 1, 3, 5, 7, and 10 tons of trash per acre. The 5-ton application, considered the best, completely covered an acre and cut soil losses 87 percent.

Although the 7- and 10-ton per acre applications cut down soil losses further, they were not significantly different from the 5-ton rate. The 3-ton rate cut soil losses 67 percent.

Plots of ten 40-inch rows, 15 feet long were used. Although the trash was spread by hand in tests, a standard manure spreader could apply up to 20 tons per acre. Test plots were subjected to wind velocities equal to 55 miles per hour.

Agricultural engineer D. W. Fryrear and soil scientist D. V. Armbrust, both of ARS, worked on the project in cooperation with the Texas Agricultural Experiment Station.

AGRISEARCH NOTES



Middle and upper pecan nuts show drying that is characteristic of shuck disease (PN-1708).

Pecan Shuck Disease Not Contagious

Shuck disease of pecan is probably the result of adverse environmental conditions.

At Shreveport, La., excessive rainfall and heavy soils that provide poor root aeration favored the development of shuck disease. ARS scientists also found that incidents of disease increased when the nutritional level or vigor of the tree is lowered by an excessively large crop of nuts, tree crowding, or defoliation by leaf disease (such as vein spot).

Shuck disease is characterized by

premature drying of the shuck, which becomes hard and black. The drying of the shuck stops the movement of food to the kernel, thus checking further development. Pecans that are affected early in the season have little or no kernel development and thin shells. Pecans affected late, however, may have almost complete kernel development and shells with normal thickness.

In years when the disease is very severe, as in 1967, it may appear as early as middle August. During seasons when the disease is mild, it may appear as late as a week or two before the nuts open normally.

ARS plant physiologist C. C. Schaller, horticulturist F. N. Dodge, and plant pathologist G. E. KenKnight found that the pecan variety Success, and varieties with Success parentage, are most severely affected. Curtis and Bradley varieties seem to be most tolerant.

CAUTION: In using pesticides discussed in this publication, follow directions and heed precautions on pesticide labels. Be particularly



careful where there is danger to wildlife or possible contamination of water supplies.

Another Chemosterilant Technique

Boobytrapped female house flies that sterilize males while mating are pioneers of a new chemosterilant technique.

ARS entomologist P. B. Morgan fastened a chamois pad treated with 50 percent metepa chemosterilant to the abdomens of virgin females. Boobytrapped females mated with males, which in turn mated with normal females. The sterility rate was determined by the hatching percentage of the eggs.

In Morgan's tests, the natural sterility of house flies did not exceed 16 percent. However, between 30 and 53 percent of the normal females mating with males that had previously mated with boobytrapped females laid eggs that were 75 to 100 percent sterile. Boobytrapped females were 100 percent sterile.

Morgan tested reactions of two different doses of metepa. He found that when males were exposed to females boobytrapped with 2 microliters of metepa, they were more lethargic than those exposed to 1.5 microliters.

Even though the boobytrap technique would be impractical to use in control of large insect populations, Morgan believes that knowledge gained may lead to a new technique for controlling flies.